ACADEMIC INTEGRATION EXAMPLES

South Dakota Agriculture, Food & Natural Resources

August 2010

South Dakota AFNR Academic Integration Activities

Table of Contents

South Dakota AFNR - Academic Integration Examples

	Core standard	AFNR Course standard
1	9-12.N.3.1 Students are able to use estimation strategies in problem situations to predict results and to check the reasonableness of results. (Analysis	Agribusiness Entrepreneurship-- E2.1 Distinguish key accounting fundamentals to accomplish dependable bookkeeping and associated files. >>Develop production and agribusiness records. >>Prepare and interpret financial statements from a given set of financial information to include balance sheet, profit/loss statement, and cash flow statement.
2	9-12.A.3.1 Students are able to create linear models to represent problem situations.	Floriculture-FL 1.3 Develop marketing and pricing strategies for retail floristry. >>Create an invoice for sale using industry standard formulas
3	9-12.G.2.1 Students are able to recognize the relationship between a three-dimensional figure and its two-dimensional representation. >Which of the following will fold into a cube?	Ag Metal Fabrication— AMF1.2 Prepare different types of metal for welding. >> Bend, shape, file and grind metals.
4	11. R. 4.1 Students can analyze a text within cultural, geographical, and historical context. >>Recognize the connection between the written work and the circumstances that produced it.	Agriscience— AS 1.1 Appraise the fundamentals of the agriculture industry and its impact in the world. >>Investigate the development of today's agriculture industry as related to the development of technology. >>Analyze the influence and impact of agriculture on the development of nations around the world. >>Examine the history of organizations that have made a significant contribution to agriculture.
5	9-12.G.2.2 Students are able to reflect across vertical or horizontal lines, and translate two-dimensional figures. >>Identify lines of symmetry.	Natural Resources— NR4.3 Recognize insect types and available controls to prevent insect infestation. >>Classify insects into their proper family groups. >>Recognize damage created by insects by observing various examples of infestation. >>Discuss emerald ash borer. >>Describe mountain pine beetle infestation.
6	9-12.S.2.1 Students are able to distinguish between experimental and theoretical probability.	Fundamental Animal Science— AN4.3 Predict genetic outcomes. >>Determine genotype and phenotype.
7	9-12.A.2.1 Students are able to use algebraic properties to transform multi-step, single-variable, first-degree equations.	Agribusiness Entrepreneurship— E.3.1 Students use strategies for optimum marketing of agricultural commodities.
8	11.R.1.1 Students can apply cause and effect clues to extend vocabulary.	Fundamental Ag Mechanics -- FAM 2.3 Repair internal combustion engines. >> Write a description of the operation of internal combustion engines.

9	11.R.2.1 Students can analyze how diction affects the interpretation of text. >> Identify slang (the non-standard vocabulary of a given culture) >> Identify colloquialisms (informal conversational diction)	Ag Communications -- AC2.2 Compose an agricultural news story.
10	11.R.2.2 Students can read fluently to comprehend grade-level text. >> Apply fluency strategies: skimming, scanning, and predicting	Natural Resrouces -- NR1.1 Explain resource management components to establish relationships in natural resource systems.
11	9-12.S.2.2. Students are able to predict outcomes of simple events using given theoretical probabilities. (Comprehension)	Advanced Animal Science -- AN 4.4 Predict genetic outcomes (Analyzing)
12	11.R.3.1 Students can analyze and explain literary devices within text. >> Recognize literary devices and communicate their effect within text: – metaphor – simile	Horticulure -- HORT 4.2 Examine soils and planting media. > Distinguish soil mix materials and characteristics.
13	11.R.5.1 Students can analyze factors that influence the credibility of informational sources. >> Identify authorship >> Identify sponsorship >> Identify purpose >> Identify audience >> Identify timeliness	Wildlife and Fisheries -- WR 2.1 Discuss the importance of hunting/harvesting fish and wildlife species and related responsibility. > Identify different viewpoints of hunting/fishing by interviewing people. > Describe wildlife harvesting techniques and procedures. > Identify management practices to protect fish and wildlife from overexploitation.
14	9-12.S.1.1. Students are able to draw conclusions from a set of data.	Fundamental Plant Science -- PS.2.2 Students examine data to evaluate and manage soil/media and nutrients. > Test soil/media and plant tissue for nutrient levels. > Interpret test of soil/media and/or plant tissue.
15	9-12.A.4.1. Students are able to use graphs, tables, and equations to represent linear functions.	Environmental Sciences -- ES1.3 Analyze population Dynamics. > Test the carrying capacity of a sample ecosystem.

These examples prepared for the Office of Curriculum and Career and Technical Education, South Dakota Department of Education, by Vivayic. August 2010.

South Dakota AFNR

Academic Integration Activities: Example #1

→ *Agribusiness Entrepreneurship students use rounding as an estimation strategy to solve problems related to operating a business.*

1. Ag Standard

Agribusiness Entrepreneurship—E2.1
Distinguish key accounting fundamentals to accomplish dependable bookkeeping and associated files.

> Develop production and agribusiness records.
> Prepare and interpret financial statements from a given set of financial information to include balance sheet, profit/loss statement, and cash flow statement.

2. Academic Standard

9-12.N.3.1
Students are able to use estimation strategies in problem situations to predict results and to check the reasonableness of results. (Analysis)

> Use rounding as an estimation strategy.

3. Background Information

One type of estimation strategy is rounding. Rounding can be used to predict results and check the reasonableness of results.

Rounding Digit
When asked to round to the closest tens, the rounding digit is the second number to the left (ten's place). When asked to round to the nearest hundred, the third place from the left is the rounding digit (hundred's place).

Steps to Rounding Whole Numbers
a. Determine rounding digit and look to the right side of it.
b. If the digit is 0, 1, 2, 3, or 4 do not change the rounding digit.
c. If the digit is 5, 6, 7, 8, or 9, the rounding digit rounds up by one number.
d. All digits on the right-hand side of the requested rounding digit will become 0.

Steps to Rounding Decimals
a. Determine rounding digit and look to the right side of it.
b. If the digit is 4, 3, 2, or 1, drop all digits to the right of it.
c. If the digit is 5, 6, 7, 8, or 9, add one to the rounding digit and drop all digits to the right of it.

Example
765.3682 becomes:
1000 when asked to round to the nearest thousand (1000)
800 when asked to round to the nearest hundred (100)
770 when asked to round to the nearest ten (10)
765 when asked to round to the nearest one (1)

765.4 when asked to round to the nearest tenth (10th)
765.37 when asked to round to the nearest hundredth (100th)
765.368 when asked to round to the nearest thousandth (1000th)

4. Example in Context

Assume a student has a pickle production business. They produce an average of 46 jars of pickles per day. Is it possible to produce 500 jars in one week?

The number to the right of the tens place is 6. Since that is greater than 5, round up.

Round 46 to the nearest tens place (46 = 50).

50 X 7 days per week = 350

Answer: No, it would not be possible to produce 500 jars in one week at that rate.

5. Guided Practice Exercises

Assume a student works at a flower shop. They sell 7 bouquets of flowers per week for $19.54 each. Will the monthly income from flower bouquets be more than $400?

Round $19.54 to the nearest tens place. The number to the right of the tens place is 9. Since that is greater than 5, round up.

Round 19.54 to the nearest tens place (19.54 = 20).

$20 X 7 days per week = $140

Round 140 to the nearest tens place (140 = 150). They make $150 per week on flower bouquets.

Multiply $150 per week times 4 weeks in a month to get monthly income.

150 X 4 = 600

Answer: Yes, 600 is greater than 400, so the monthly income from flower bouquets is greater than $400.

6. Independent Practice Exercises

Assume a student plans to sell some of his own cattle. He plans to sell 22 head of steers for $987.12 each. Will his check be about $20,000?

Answer: Yes. (20 X 1,000 = 20,000)

Assume a student works at a welding shop. They build 31 feed bunks per month and sell each for $197.99. Will the income from feed bunks after 6 months be about $36,000?

Answer: Yes. (30 X 200 = 6,000; 6,000 X 6 = $36,000)

7. Notes

An Agribusiness Entrepreneurship teacher could challenge her students by issuing a worksheet that involves estimations in the business world. She first would review how to use rounding as a strategy. Her goal is to improve students' ability to predict results and check reasonableness of results that are related to accounting fundamentals of their self-developed businesses.

South Dakota AFNR

Academic Integration Activities: Example #2

→ *Floriculture students develop floristry prices by using linear equations.*

1. Ag Standard

Floriculture—FL 1.3
Develop marketing and pricing strategies for retail floristry.

> Create an invoice for sale using industry standard formulas.

2. Academic Standard

9-12.A.3.1
Students are able to create linear models to represent problem situations.

3. Background Information

Example: A telephone bill is $10 per month plus $0.30 per minute for long distance calls. Write an equation in slope-intercept form that expresses the total amount of the phone bill.

slope-intercept form: y = mx + b

m = slope of the line
x = variable
b = y-intercept

slope = rise/run

4. Example in Context

The flower shop charges $25 for a bouquet of six lily flowers. Each additional lily costs $2.75. Write an equation in slope-intercept form that expresses the total amount of the flower bouquet bill.

Remember, the slope-intercept form is y = mx + b

b = set cost ($25)
m = cost that changes according to the x variable

Answer: y = 2.75x + 25

5. Guided Practice Exercises

Assume the gift shop sells rose boutonnieres for a beginning price of $9. Each additional small rose adds an extra $2.50 to the price. Write an equation in slope-intercept form that expresses the total amount of a boutonniere.

m = slope of the line = $2.50
b = y-intercept, set number = $9

Answer: y = 2.5x + 9

6. Independent Practice Exercises

Assume the gift shop sells candy bouquets. The starting price is $16 for five candy bars and another $1.99 for each additional candy bar. Write an equation in slope-intercept form that expresses the total amount of the candy bouquet bill.

Answer: y = 1.99x + 16

Assume the flower shop sells Mother's Day pink chrysanthemums in wicker baskets. The wicker basket costs $11, and each flower is $3. Write an equation in slope-intercept form that expresses the total amount a Mother's Day gift would cost.

Answer: y = 3x + 11

7. Notes

[None]

South Dakota AFNR

Academic Integration Activities: Example #3

→ *Ag Metal Fabrication students use geometry shapes to determine how to cut and bend metal to create metal box projects.*

1. Ag Standard

Ag Metal Fabrication—AMF1.2
Prepare different types of metal for welding.

> Bend, shape, file, and grind metals.

2. Academic Standard

9-12.G.2.1
Students are able to recognize the relationship between a three-dimensional figure and its two-dimensional representation.

> Which of the following will fold into a cube?

3. Background Information

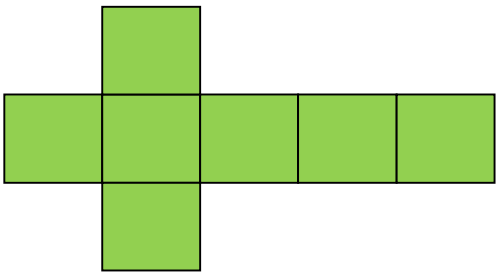
Steps to Make a Net Diagram of a Box

a. Start with six squares since there are six sides to a cube.
b. Arrange the six squares so they fold into a cube.
c. Think of a cube as four sides, a top, and a bottom.
d. First choose one square to be the base of the cube in your mind.
e. Then imagine the sides folding up around the base.
f. The last square should flip over to be the top of the cube.

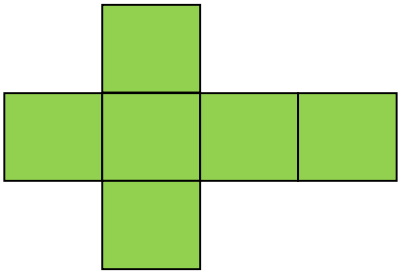
4. Example in Context

Students are asked to create a small box by bending and shaping metal. They first diagram their box design on paper to determine how it will fold. Using geometry knowledge, they will create a model that will fold into a box.

Student A creates this design. He cuts out the paper model and practices folding it to ensure his diagram will work.



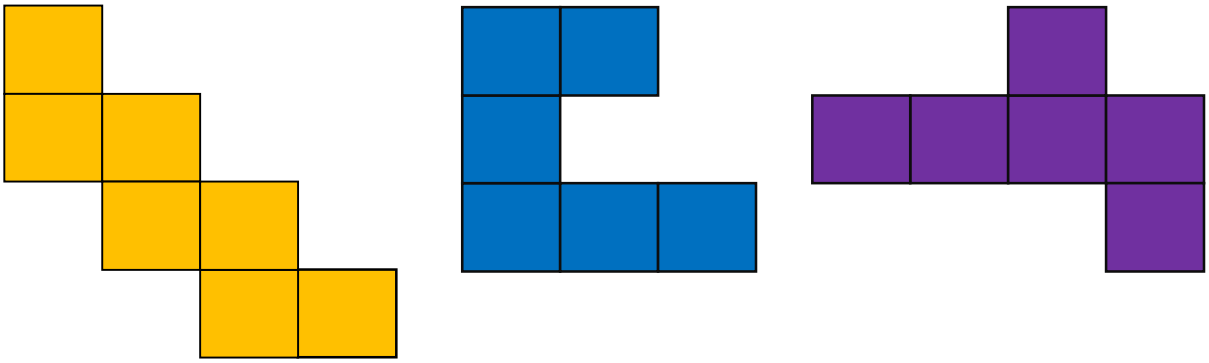
After he tries folding this model, he realizes he has one too many squares. He only needs six. He tries again by cutting off one square cube of the paper.



This time the paper folds perfectly into a box. He can now lay this paper model onto the metal and trace around the outline. He also can measure the dimensions of the boxes to make marks on the metal for the appropriate bends.

5. Guided Practice Exercises

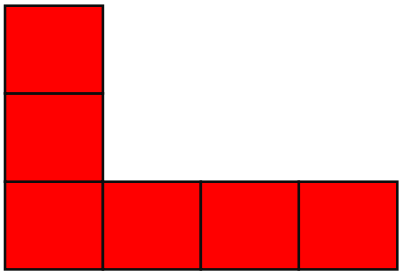
An Ag Metals teacher assigns students to build a pencil-box by bending and shaping metal. She provides a worksheet that includes various possibilities to use to make the box. Students must choose which model would accurately fold into a square box. Once students have selected the correct diagram, they will enlarge the dimensions to create a pencil-box. Which diagram should they use?



Answer: Students should use the purple figure because it folds into a box.

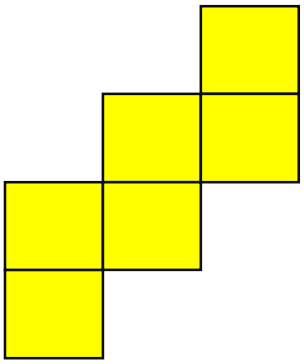
6. Independent Practice Exercises

Student X sketches the following diagram to use for his metal box project. If he uses this diagram, will his metal fold into a box?



Answer: No, there will be overlapping sides.

Student Y sketches the following diagram to use for his metal box project. If he uses this diagram, will his metal fold into a box?



Answer: Yes, there is the correct number of squares, and they each fold to represent one side of the box.

7. Notes

During an Ag Metals class, these geometry figures could be used in a variety of ways:

- Students sketch diagrams and cut out of paper to practice basic skill of understanding the folds.
- Students are provided various correct and incorrect diagrams to test.
- Students sketch diagrams and use them to create a metal bending project.
    - Lay diagram on metal and trace it.
    - Measure dimensions of diagram, adjust to desired size, and mark dimensions on metal.
- Students are provided with a worksheet that contains hypothetical situations to use these shapes for metal bending. Students determine which examples would and would not work.

Alternative: Instead of using paper to create the diagrams, sketch them on thin cardboard, such as a cereal box. Paper may be too flimsy for this type of project.

South Dakota AFNR

Academic Integration Activities

→ *Agriscience students read articles about organizations that have contributed to agriculture while applying their reading knowledge involving analyzing historical, geographical, and cultural texts.*

1. Ag Standard

Agriscience—AS 1.1

Appraise the fundamentals of the agriculture industry and its impact in the world.

> Investigate the development of today's agriculture industry as related to the development of technology.
> Analyze the influence and impact of agriculture on the development of nations around the world.
> Examine the history of organizations that have made a significant contribution to agriculture.

2. Academic Standard

11. R. 4.1

Students can analyze a text within cultural, geographical, and historical context.

> Recognize the connection between the written work and the circumstances that produced it.

3. Background Information

The over-riding goal of analyzing writing is to demonstrate some new understanding of the text.

How to Analyze Text

a. Read or reread the text with specific questions in mind.
b. Organize basic ideas, events, and names.
c. Think through your personal reaction to the writing.
d. Identify and consider the most important ideas.
e. Return to the text to locate specific evidence and passages related to the major ideas.
f. Identify a thesis or topic sentence indicating a basic observation or assertion about the text.
g. Discuss what happens in the passage and why it is significant to the work as a whole.
h. Consider what is said – particularly the ideas that are expressed.
i. Assess how it is said, considering how the word choice, ordering of ideas, sentence structure, etc. contribute to the meaning of the passage.

4. Example in Context

Consider these questions:

a. What thoughts/feelings does the author have regarding the article's topic?
b. What comparisons does the author make and why?
c. What organization does this article credit for having a contribution to agriculture, and why is it believed to be significant?

Mike Rowe from "Dirty Jobs" reflects on his experience at the 2009 National FFA Convention.

"For those of you who don't know, The FFA is an organization of 500,000 teenagers, most of who look like they fell off the front of a Wheaties box. Wholesome, polite, and impossibly well mannered, these are the kids you wish you had, diligently pursuing an adolescence of agricultural acumen. Unfortunately, I arrived at their annual convention with the same level of planning and forethought I brought on my last visit, (i.e., none,) and found myself pacing in the wings twenty minutes before my appearance, trying to arrange my thoughts into an 'inspirational and G-Rated

Answer:

Reading Standard

a. Mike Rowe views the National FFA Organization and the many members of the group in a very positive and supportive light. His word choice and voice in this article are pleasant and intriguing.

b. FFA members are compared to those on the front of a Wheaties box. He writes: "…polite, impossibly well mannered, these are the kids you wish you had, diligently pursuing an adolescence of agricultural acumen…" He probably decided to compare those types of kids because of the positive qualities he sees them both having.

Ag Standard

c. National FFA Organization is credited because it is a very large student organization that has hardworking and responsible adolescents that are excited about the world of agriculture. He indicates there are over 500,000 diligent teenagers in the organization.

5. Guided Practice Exercises

Consider these questions:

a. What cultural issues are brought up in this portion of the document?
b. How is today's agricultural industry impacted by the development of technology?

"The FFA currently faces an image and perception problem. The previous name of the organization, 'Future Farmers of America,' lends itself to stereotyping by the public. The FFA faces a continuing battle to redefine itself against narrow perceptions of 'agriculture,' 'vocational' and 'farmers.' The name 'FFA' is now used instead of 'Future Farmers of America.' Incredible. Have we really become so disconnected from our food that farmers no longer wish to be called farmers? Apparently, yes. The FFA has determined that most Americans think of farmers like those actors in Colonial Williamsburg – smiling caricatures from Hee Haw and Green Acres, laboring quaintly in flannel and denim. From what I've seen, they're right. Over and over I hear the same thing from

Answer:

Reading Standard

a. *Cultural barriers create misperceptions and stereotypes of farmers. Farmers have a historical image that is often hard to overcome in this age. The author, Mike Rowe, indicates that the FFA Organization believes that many Americans view farmers in an old-fashioned manner because they are disconnected.*

Ag Standard

b. *Technology has modernized the farmer. Efficiency has been improved greatly because of technology, meaning technology has played a large role in the Ag industry. He writes, "Technical advances in modern agriculture now rival those of Silicon Valley, and today's farms are more efficient than ever, but no one seems to have gotten the memo. No one seems to care."*

6. Independent Practice Exercises

Consider these questions:

a. Who is the author's intended audience?
b. What is the purpose for writing this article?
c. What does this article indicate about agriculture's impact on other nations?

> "As I spoke with various farmers that evening, I realized that I had asked the wrong question. 'Why?' is too easy. Obviously, today's farmers need a PR Campaign because they are beset by an army of angry acronyms, each determined to change modern agriculture in a way that better reflects their particular worldview. The better question is 'How.' How is it that 300 million Americans – all addicted to eating – have become disconnected from the people who grow our food? What new priorities have captured our shared concern?
>
> On Dirty Jobs, I'm no expert, and I'm even less of one here. But I have a theory, and it goes like this – all jobs rely on one of two industries – mining and agriculture. Every tangible thing our

Answer:

Reading Standard

a. *The uninformed and agriculturists are the intended audience.*
b. *The goal of the article was to educate those who are disconnected from our food source and inspire agriculturists by offering support.*

Ag Standard

c. *Civilization begins with miners and farmers. Agricultural has had an impact on our world by being the source of many things.*

Consider these questions:

a. What do you think was the author's intention when he produced this written document?
b. What organization does this article credit for having a contribution to agriculture and why is it believed to be significant?

"Could this be the root cause of the FFA's 'perception problem?' Could our warped view of the modern farmer be just another symptom of our warped relationship with work in general? It's just a theory, but how else can we explain a country that marginalizes and stereotypes the very people we depend on most? From what I've seen, most people like farmers. Most people like food. The problem is Work. We've spent decades trying to distance ourselves from traditional notions of Work. And who embodies Work more than The American Farmer?

There is something to be said for occasionally finding yourself in the company of like-minded people. And every so often, if you can get your thoughts organized in time, it's fun to address the

Answer:

Reading Standard

a. *Mike Rowe wants to share his passion about agriculture and work. He wants to share the insight he gained from attending the National FFA Convention.*

Ag Standard

b. *National FFA Organization is credited because it has attempted to diffuse the negative stereotypes placed on farmers.*

7. Notes

A variety of written work could be used to facilitate a lesson about agriculture's impact on the world and analyze articles within a certain context. Similar activities could be done with news articles, magazine stories, historical documents, FFA handbook writings, etc. Worksheets could be developed that use many different sources instead of small divisions of one long article (such as the example shown here).

South Dakota AFNR

Academic Integration Activities: Example #5

→ *Natural Resources students identify lines of symmetry that exist in nature.*

1. Ag Standard

Natural Resources—NR4.3
Recognize insect types and available controls to prevent insect infestation.

- > Classify insects into their proper family groups.
- > Recognize damage created by insects by observing various examples of infestation.
- > Discuss emerald ash borer.
- > Describe mountain pine beetle infestation.

2. Academic Standard

9-12.G.2.2
Students are able to reflect across vertical or horizontal lines and translate two-dimensional figures.

- > Identify lines of symmetry.

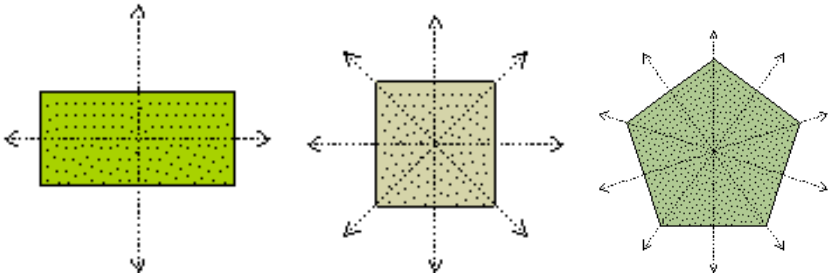
3. Background Information

A line of symmetry divides a figure into two congruent halves. (Congruent means similar, matching, or fitting.)

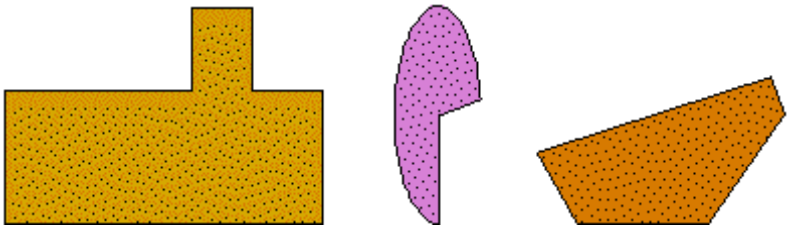
How to Find Lines of Symmetry

a. Look for midpoints in the shape.
b. Use a ruler to draw a straight line through the estimated midpoint.
c. Fold the shape in half to see if both sides match. If they do, it is a line of symmetry.

A rectangle has two lines of symmetry because there are two ways to divide the shape into two congruent halves. A square has four lines of symmetry because there are four ways to divide the shape into two congruent halves. A regular pentagon has five lines of symmetry.



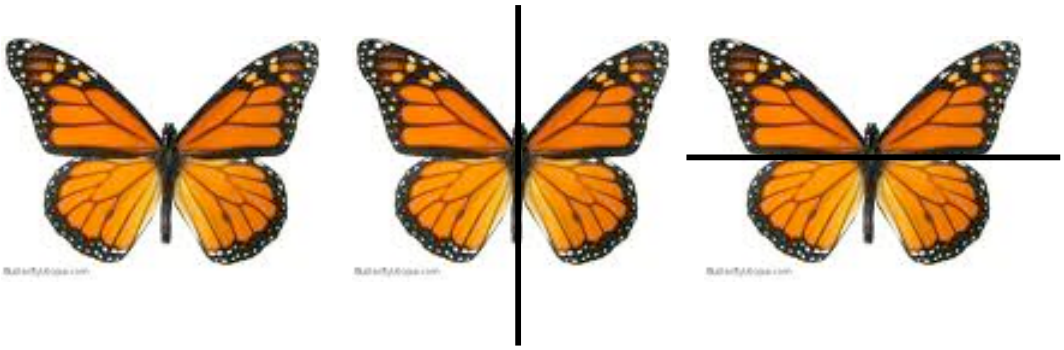
There are shapes that have no lines of symmetry. Here are some examples:



4. Example in Context

Students are studying the insect Order Lepidoptera (butterflies). They review how to determine lines of symmetry. Then they use their geometry skills to identify the symmetrical portions of the insects.

Students are pinning butterflies for their collection. How many lines of symmetry does this Monarch Butterfly have?



Yes, a line of symmetry No, not a line of symmetry

Answer: One line of symmetry. The insect can be divided into two congruent (matching) halves if a line is drawn down the midsection. This is bilateral symmetry. There are not two lines of symmetry because a horizontal line does not split the insect into two congruent sides.

5. Guided Practice Exercise

Students are discussing the insect Emerald Ash Borer. They examine images of trees that have been damaged by the beetle. How many lines of symmetry does the infested ash tree have?

Answer: None. There are no lines that can be drawn on the tree to create two congruent (similar) sides. Emerald Ash Borers do not follow a certain pattern when they bore into ash trees. Therefore, the path created will not have lines of symmetry.

6. Independent Practice Exercises

Students are describing mountain pine beetle infestation and are learning to properly indentify and classify the insect. They recognize the lines of symmetry that exist within the Order Coleoptera.

How many lines of symmetry does the mountain pine beetle have?

Answer: One line of symmetry. Drawing one bilateral line creates two congruent (similar) sides.

Students are learning to recognize insect damage in various plants. While viewing healthy and infested pictures of leaves, they note the lines of symmetry that exist.

How many lines of symmetry are there in healthy leaves and in infested leaves?

Answer: Healthy leaves have one line of symmetry. Leaves that have been damaged by insects have no lines of symmetry because of the holes that have been created.

7. Notes

Lines of symmetry appear frequently in nature and could teach geometry in a variety of ways:

- Diagram lines of symmetry on worksheets.
- Identify lines of symmetry in the insects they classify and collect.
- Recognize or rule out the possibility of symmetrical lines in leaves, trees, etc.

South Dakota AFNR

Academic Integration Activities: Example #6

→ *Animal Science students distinguish between experimental and theoretical probability as it relates to genetic outcomes.*

1. Ag Standard

Fundamental Animal Science—AN4.3
Predict genetic outcomes.

> Determine genotype and phenotype.

2. Academic Standard

9-12.S.2.1
Students are able to distinguish between experimental and theoretical probability.

3. Background Information

Probability: Likelihood an event will occur expressed as a ratio.
Experimental probability: Conduct an experiment to determine probability.

$$\text{Experimental probability} = \frac{\text{Number of event occurrences}}{\text{Number of total trials}}$$

Theoretical probability: Use equation to determine probability.

$$\text{Theoretical probability} = \frac{\text{Number of favorable outcomes}}{\text{Number of total outcomes}}$$

Example: Determine which of the two activities represents experimental probability:

a. Roll two dice many times, record the sums, and write the probabilities of different sums
b. Create a sample space of all possible outcomes and write the probabilities of different sums

Answer:
a = experimental
b = theoretical

4. Example in Context

Which activity represents theoretical probability? Which activity represents experimental probability?

a. Mate a Hereford bull with twenty Angus heifers, record the calves' phenotypes, and write the probabilities of different phenotypes
b. Create a sample space of probable outcomes and write the probabilities of different phenotypes

Answer:
a = experimental probability. This would involve an actual experiment being conducted to determine the ratios of phenotypes.
b = theoretical probability. The theoretical probability formula would be used for activity b.

5. Guided Practice Exercise

Which activity represents theoretical probability?

a. Make a list of likely results and calculate the probability of one plant producing four tomatoes
b. Grow many tomato plants, record the number of tomatoes produced by each one, and record the probability of one plant producing four tomatoes

Answer: A. The first activity shows how a theoretical ratio could be found without an actual experiment being conducted.

6. Independent Practice Exercises

Which activity represents experimental probability?

a. Name the probable outcomes, and write the probability of having a white mouse after breeding two black mice together
b. Breed several black mice to other black mice, record the number of white offspring, and write the probability of having a white mouse

Answer: B.

Which activity represents theoretical probability?

a. Create a sample space of probable outcomes, and write the probability of producing a normal rabbit after mating an albino rabbit with a brown rabbit
b. Mate an albino rabbit with a brown rabbit, record the number of normal (non albino) rabbits, and write the probability of having a normal rabbit

Answer: A.

7. Notes

Students in Ag class could actually complete each of the activities to determine the phenotype outcome and help them learn genetic principles. After doing the activities – theoretically and experimentally – students can identify which method demonstrated each type of probability calculation.

South Dakota AFNR

Academic Integration Activities: Example #7

→ *Agribusiness Entrepreneurship students apply algebraic equations to livestock market prices.*

1. Ag Standard

Agribusiness Entrepreneurship—E.3.1
Students use strategies for optimum marketing of agricultural commodities.

2. Academic Standard

9-12.A.2.1
Students are able to use algebraic properties to transform multi-step, single-variable, first-degree equations.

3. Background Information

Order of operations: When performing algebraic equations, a certain order of mathematical operations should be followed. Use the acronym shown here to remember the order and work left to right.

> PEMDAS (Please Excuse My Dear Aunt Sally)
> Parenthesis—Exponents—Multiply—Divide—Add—Subtract

4. Example in Context

A rancher sells 43 head of calves, each weighing an average of 634 lbs. His check (before charges were subtracted) was $28,625. How much did the calves bring per pound?

28,625 = (634 * 43)x

x = $1.05

Review order of operations: PEMDAS
Determine what x means: x is the dollar amount per pound.

Calculate inside of parenthesis first.
634 * 43 = 27,262

Substitute that number.
28,625 = 27,262x

Divide on both sides to find X.
$\frac{28,625}{27,262} = \frac{27,262x}{27,262}$

1.05 = x

Answer: x = $1.05 per pound

5. Guided Practice Exercise

A rancher wants to sell two loads of calves. The first bunch of 13 calves averages 524 lbs, and the second bunch of 17 averages 648 pounds. He gets two checks – one for each bunch. The smaller herd brings $1.09 per pound; the larger bunch brings $1.04 per pound. There is $15 per calf deducted for various charges, including commission, beef check-off, vet services, etc. How much does he make total?

1.04 * 524 * 13 + 1.09 * 648 * 17 – 15 (13 + 17) = x

Review order of operations: PEMDAS
Determine what x means: x is dollar amount the rancher receives.

Calculate inside of parenthesis first, working left to right.
13 + 17 = 30

Substitute those numbers into the equation.
1.04 * 524 * 13 + 1.09 * 648 * 17 – 15 (30) = x

Multiply, working left to right.
1.04 * 524 * 13 = 7,084.48
1.09 * 648 * 17 = 12,007.44
15 * 30 = 450

Substitute those numbers into the equation.
7,084.48 + 12,007.44 – 450 = x

Add, and then subtract, working left to right.
7,084.48 + 12,007.44 – 450 = 18,641.92

x = 18,641.92

Answer: The rancher's check is $18,641.92

6. Independent Practice Exercises

A rancher decides to sell his calves. The 55 head of steers average 622 lbs, and 59 heifers average 601 lbs. Both bunches bring $1.11. He wants to average out four head for his son. How much does his son make?

$$\left\{ \frac{1.11\,(55 * 622 + 59 * 601)}{(55 + 59)} \right\} * 4 =$$

Answer: The son makes $2, 713.42.

A rancher sells 17 head of calves. They bring $1.03. His check (before charges were subtracted) was $9,928.17. How much did the calves weigh on average?

9,928.17 = (17 * 1.03)x

Answer: x= 567 lbs average weight

7. Notes

Word problems and algebraic equations could be created for other agricultural commodities, such as corn, soybeans, or wheat.

These calculations also could be taught in an animal science course.

South Dakota AFNR

Academic Integration Activities: Example #8

→ *Fundamental Ag Mechanics students use cause and effect clues to understand the operation of a four stroke internal combustion engine.*

1. Ag Standard

Fundamental Ag Mechanics—FAM 2.3

Repair internal combustion engines.

> Write a description of the operation of internal combustion engines.

2. Academic Standard

11.R.1.1

Students can apply cause and effect clues to extend vocabulary.

3. Background Information

The cause of an action or event may be stated using an unfamiliar word. If the effect is stated in familiar terms, it can help the reader understand the unknown word.

Example: The weeds in the garden are so profuse that I can no longer see the flowers.

What does the word "profuse" mean?

> Cause: There are many weeds.
> Effect: You can't see the flowers.
> Profuse must mean a large amount of something.

Words signaling cause and effect:

> Because
> Since
> Therefore
> Consequently
> As a result
> So
> That

4. Example in Context

The intake valve is open during the *intake stroke*. As a result, the air/fuel mixture enters into the cylinder and combustion chamber.

> Signal word: As a result

- Cause: Intake value is open
- Effect: Air/fuel mixture can enter the cylinder
- Intake stroke must mean a period before power is created or a time when new fuel comes into the cylinder

5. Guided Practice Exercises

A spark leads to *combustion*; consequently, the explosion pushes the piston and the crankshaft.

- Signal word: Consequently
- Cause: A spark
- Effect: An explosion that creates power
- Combustion must mean lighting the fuel/air mixture to create an explosion

6. Independent Practice Exercises

As the piston pushes the fuel/air mixture into a smaller space, it creates *compression* because pressure on the fuel/air mixture is greater than before.

- Signal word: Because
- Cause: Piston pushing the air/fuel mixture into a smaller space
- Effect: Increased pressure
- Compression must be an action than increases the pressure on something

7. Notes

Have students look for examples of cause and effect signal words in text books and technical manuals.

South Dakota AFNR

Academic Integration Activities: Example #9

→ *Ag Communication students understand how slang and colloquialisms impact the meaning of text in news stories.*

1. Ag Standard

Ag Communications –AC2.2

Compose an agricultural news story.

2. Academic Standard

11.R.2.1

Students can analyze how diction affects the interpretation of text.

- > Identify slang (non-standard vocabulary of a given culture)
- > Identify colloquialisms (informal conversational diction)

3. Background Information

Informal language, such as slang and colloquialisms, can affect the meaning of text because using slang and colloquialisms can indicate who wrote the text and where the text was written.

Slang is generally defined as language peculiar to a particular group (e.g. teenagers, surfers, soldiers, etc.).

A colloquialism is a word or phrase that is typically only used in a certain area or region (i.e. "pop" in the Midwest vs. "soda" on the coasts vs. "coke" in the South).

4. Example in Context

Read the following text from a news article:

> "While there are a number of great upgrades on the latest version of the 9000-series combine, perhaps the most impressive is what operators can expect in the cab. The new design is tight; operators will feel like they are driving a luxury performance car with heated and cooled seats, wood inlayed panels, and sleek and easy-to-read controls."

Ask these questions rhetorically and answer the questions aloud:

- > Where was informal language used? (the word "tight")
- > Is this slang or a colloquialism? (slang, as it is language used by a group [teenagers] – not in a region)
- > How does the use of this diction affect our interpretation of the text? Or, how would the story have been different if the word "superb" had been used instead of "tight"? (many possible answers)

5. Guided Practice Exercises

Read the following text from a news article:

> "This year's legislative session has left many state representatives feeling rode hard and put up wet when it came to water policy issues. 'I've been involved in 18 legislative sessions and have never been so exhausted as I am after this one,' said Representative Dan Hall. Representatives dealt with 16 bills introduced to the floor related to water policy in the state. Dozens of hearings were held, hundreds of amendments were considered, and countless emails, letters, phone calls were received. Water has become a hot topic for farmers, ranchers, and urban residents alike as the state enters its fourth year of a persistent drought."

Ask these questions rhetorically and answer the questions aloud:

- Where was informal language used? (the phrase "rode hard and put up wet")
- Is this slang or a colloquialism? (colloquialism, as it is language used typically only in the Western U.S.)
- How does the use of this diction affect our interpretation of the text? (many possible answers)
- What other word or phrase could have been used in place of "rode hard and put up wet"?

6. Independent Practice Exercises

There are three tasks in this exercise:

- Identify a list of three slang words or phrases. List the group that is most likely to use them.
- Identify one colloquialism unique to this area of the country.
- Write the lead paragraph of a news story that correctly uses one of the slang words or the colloquialism.

7. Notes

You can refer back to this activity as students begin to write and review more news articles. You can have students try to find slang and colloquialisms in ag publications.

South Dakota AFNR

Academic Integration Activities: Example #10

→ *Natural Resources students use comprehension skills to read articles about natural resource systems.*

1. Ag Standard

Natural Resources--NR1.1

Explain resource management components to establish relationships in natural resource systems.

2. Academic Standard

11.R.2.2

Students can read fluently to comprehend grade-level text.

> Apply fluency strategies: skimming, scanning, and predicting.

3. Background Information

Reading comprehension (understanding what is read) can be improved when strategies are employed.

Scanning

As the name implies, you scan the entire text looking for key terms or main points. You take a quick look at images and graphs. The scanning process should only take 5 to 10 seconds per page. The goal is to get a general sense of the text.

Skimming

Skimming is more involved than scanning, but still not reading every word. You might read the first and last sentences of paragraphs because that's where main ideas are often provided. The goal is to find the main ideas provided in the text.

Predicting

After scanning and skimming, but before reading the text word-for-word, take a moment to predict what the text will communicate: will the text share an opinion, tell a story, provide useful information, challenge existing ideas, etc?

4. Example in Context

Share the following article on screen or in a handout with students.

First, demonstrate how you would scan the article. (Quick look for key info: 5 to 10 seconds)

> Note the title.
> Note the image of leafy spurge.
> Note the words "enemies" and "outcompete" used frequently.

Next, demonstrate how you would skim the article ("reading" at three to four times normal speed).

> Note the first sentence (nice summary).
> Note the next-to-last paragraph, which contains the key points.

Next, demonstrate how you would predict what the text will communicate.

> Explain that the title makes you think the text will tell about the reasons something is happening.
> Share that you think the reasons will have something to do with exotic plants, their enemies, and the climate change.

Read the article aloud, stopping to make comments, reflecting on your prediction. You can also comment on information in the text that is less useful than other text (such as who funded the research) and how you can sort that out by relying on what you learned from scanning, skimming, and predicting.

Discuss how this article helps deepen understanding of how natural resource systems are inter-related and why proper management is key.

Why Invasive Plants Take Over
By Don Comis
April 30, 2009

New research shows that two key causes of plant invasion--escape from natural enemies, and increases in plant resources--act in concert. This result helps to explain the dramatic invasions by exotic plants occurring worldwide. It also indicates that global change is likely to exacerbate invasion by exotic plants.

Agricultural Research Service (ARS) ecologist Dana Blumenthal reached these conclusions after studying 243 European plant species and their fungal and viral pests, both in Europe and in the United States.

The study was published this week in the Proceedings of the National Academy of Sciences. Blumenthal, based at the ARS Rangeland Resources Research Unit in Fort Collins, Colo., and colleagues at the University of North Carolina and in the Czech Republic showed that fast-growing plant species adapted to moist, nitrogen-rich soils had many fungal and viral pathogens in the areas where the weedy species evolved. Once these species arrived here, they escaped many of their long-time enemies.

Such an escape from numerous enemies is thought to provide exotic species with an advantage over native species still burdened by their enemies. This is the first study, however, to show that whether a plant escapes from a few or an unusually larger number of enemies can be predicted from the type of plant: Exotic species that are fast-growing and weedy are likely to have more enemies to escape from.

Unfortunately, these are the same species most favored by global change. Fast-growing weedy species thrive in environments with ample plant resources. And global change increases key plant resources, such

as carbon dioxide and soil nitrogen, through increases in the greenhouse gases carbon dioxide and nitrous oxide, respectively.

Fast-growing, weedy exotic species therefore have a double advantage in today's world. Increases in resources enable them to outcompete slow-growing plants. An escape from an unusually large number of enemies enables them to outcompete even fast-growing native plants. As global change proceeds, continuing increases in resource availability are likely to exacerbate such plant invasions.

The National Science Foundation, the European Union, and the Czech Republic supported the study. ARS is the principal intramural scientific research agency in the U.S. Department of Agriculture.

Note: This article can be found online at
http://www.ars.usda.gov/is/pr/2009/090430.htm?pf=1#_top

5. Guided Practice Exercises

Share the next article. Follow the same steps, but have the group respond to the questions first. Clarify and assist only as needed.

Scan the article. (Quick look for key info: 5 to 10 seconds)

> What did you take note of?

Skim the article ("reading" at three to four times normal speed).

> What key information stands out to you?

Predict what the text will communicate.

> What will this article tell us? Why do you think that?

Read the article aloud, stopping to make comments reflecting on the group's prediction.

Again, reflect on how this article helps deepen understanding of how natural resource systems are inter-related and why proper management is key.

Elevated Carbon Dioxide Spurs Shrub Growth
By Rosalie Marion Bliss
August 28, 2007

Shrubs far outgrew native grasses in Colorado rangeland when exposed to elevated levels of carbon dioxide (CO_2), according to a study published by Agricultural Research Service (ARS) scientists and cooperators at Colorado State University.

The results suggest that rising CO_2 levels in the Earth's atmosphere may be contributing to shifts in plant community dynamics, in which woody vegetation is favored over perennial forage grasses.

The study will be published in this week's online edition of the Proceedings of the National Academy of Sciences. Plant physiologist Jack A. Morgan, research leader of the ARS Rangeland Resources Research Unit in Fort Collins, Colo., led the study. ARS is the U.S. Department of Agriculture's chief scientific research agency.

During the past 200 years, shrubs have expanded their reach into many of the world's grasslands, reducing the amount and quality of forage available to livestock. Some scientists theorize that elevated atmospheric CO2 concentrations have spurred that growth. But evidence as to the underlying reasons behind the problem of woody plant encroachment has been lacking.

The experiment was conducted on native short grass prairie in northern Colorado. To simulate elevated atmospheric CO2 conditions and make comparisons, the scientists used six large open-top chambers. Three of the chambers were infused with air injected with 360 parts per million (ppm) of CO2—to model today's atmosphere. The other three chambers were infused with air injected with twice the control amount—or 720 ppm—of CO2. That's roughly the atmospheric concentration expected by the end of the century.

Among the 34 plant species exposed to 720 ppm of CO2, the scientists found a 40-fold increase in aboveground biomass of fringed sage, Artemisia frigida, a widespread shrub in rangelands of North America and Asia. Growth of only one other species, Stipa comata, a relatively low-forage-quality perennial grass, was also significantly affected by the CO2, as previously reported. S. comata showed only a two-fold increase in biomass due to CO2.

The results support present theories that rising CO2 may be altering the botanical structure of world grasslands and contributing to their degradation.

Note: This article can be found online at
http://www.ars.usda.gov/is/pr/2007/070828.htm?pf=1#_top

6. Independent Practice Exercises

Direct students to the News archive of the USDA Agricultural Research Service:
http://www.ars.usda.gov/is/pr/

> Find an article that addresses the relationships in natural resource systems
> Browse the article titles. Select an article and use scanning and skimming to predict if the article meets the assignment requirements.
    - If so, print the article and highlight or circle the components and or words that led you to make the prediction.
    - If not, search for another article until you find one.

7. Notes

Repeat these strategies on occasion to reinforce their use.

South Dakota AFNR

Academic Integration Activities: Example #11

→ *Advanced Animal Science students use theoretical probabilities to predict simple genetic outcomes.*

1. Ag Standard

Advanced Animal Science –AN 4.4
Predict genetic outcomes. (Analyzing)

2. Academic Standard

9-12.S.2.2
Students are able to predict outcomes of simple events using given theoretical probabilities. (Comprehension)

3. Background Information

Where experimental probability relies on using actual data from an experiment, theoretical probability is determined by noting all the possible outcomes theoretically and determining the likelihood of the given outcome.

The formula for theoretical probability of an event is:
P(event) = number of favorable outcomes/number of total outcomes

Example: A bag contains 10 red marbles, 8 blue marbles, and 2 yellow marbles. Find the theoretical probability of getting a blue marble.

Solution: There are 8 blue marbles. Therefore, the number of favorable outcomes = 8. There are a total of 20 marbles. Therefore, the number of total outcomes = 20.

P = 8/20 which can be expressed as a fraction 2/5, a ratio 2:5, a percentage 40%, or a decimal 0.4.

4. Example in Context

Assume you have a herd of 200 beef cows. This summer you are using the following bulls:

- 3 sons of Almighty
- 2 sons of PowerHouse
- 2 sons of BeefMaker
- 1 son of TBone

Predict the probability that a calf next spring will be sired by a son of PowerHouse.

Review the formula.
P(event) = number of favorable outcomes/number of total outcomes

Find the total number of outcomes.
8 in this example (3+2+2+1)

Find the total number of favorable outcomes (son of PowerHouse).
2 in this example

Therefore, the theoretical probability is 2/8, which can be reduced to 1/4. There are different ways to say this: 25%, 0.25 (decimal), or 1:4 (ratio).

5. Guided Practice Exercises

Assume you have a herd of 400 beef cows. Last winter you used the following bulls:

- 4 sons of MoneyMaker
- 4 sons of CashCow
- 2 sons of Awesome
- 2 sons of BigBoy

Predict the probability that a calf this fall will be sired by a son of CashCow. Express your answer as a ratio.

Answer: 4/12 reduced to 1/3. As a ratio, the answer is 1:3.

6. Independent Practice Exercises

Assume you have a herd of 100 beef cows. Last summer you used the following bulls:

- 2 sons of MoneyMaker
- 1 son of CashCow
- 1 son of Awesome

Predict the probability that a calf this spring will be sired by a son of MoneyMaker. Express your answer as a fraction.

Answer: 2/4 reduced to 1/2.

Assume you have a flock of 500 ewes. Last fall you used the following rams:

- 8 sons of #545
- 4 sons of #22
- 4 sons of #778
- 4 sons of #402

Predict the probability that a lamb this spring will be sired by a son of #402. Express your answer as a percentage.

Answer: 4/20 reduced to 1/5. As a percentage, the answer is 20%.

7. Notes

This activity can lead into a discussion about Expected Progeny Differences (EPDs). EPDs use very complex theoretical probabilities to predict the outcome of offspring based on genetic traits.

South Dakota AFNR

Academic Integration Activities: Example #12

→ *Horticulture students use metaphors and similes to distinguish planting media.*

1. Ag Standard

HORT 4.2
Examine soils and planting media.

> Distinguish soil mix materials and characteristics.

2. Academic Standard

11.R.3.1
Students can analyze and explain literary devices within text.

> Recognize literary devices and communicate their effect within text:
    - Metaphor
    - Simile

3. Background Information

Metaphors and similes are both figures of speech used to draw comparison. They are typically used to add color and voice to text. Formal and technical writing typically avoids the use of either metaphors or similes.

Metaphor

A metaphor is an analogy between two objects or ideas. The analogy is conveyed by the use of a metaphorical word in place of some other word. Review these examples:

> The bucking bull was a steamroller and sports car in one.
    - Creates the analogy that the bull was both strong and quick.
> His question shown light on the issue that no one had been willing to address.
    - The question didn't actually create a light.
> Jill's comment created a code red emergency among the 7th grade girls.
    - The comment didn't create an actual emergency – just the reaction as if it were one.

Simile

A simile is a figure of speech comparing two unlike things, often introduced with the words "like" and "as." Occasionally, a simile uses the word "than" to compare to unlike things. Review these examples:

> She kicks as hard as a mule.
> The bedroom closet was like the aftermath of a tornado.
> I am happier than a puppy with two tails!

4. Example in Context

Plant growing media: Sand

Sand, a basic component of soil, ranges in particle size from 0.05mm to 2.0mm in diameter. Medium and coarse sand particles are those that provide optimum adjustments in media texture, resulting in increased drainage and aeration. Although sand is generally the least expensive of all inorganic amendments, it is also the heaviest.

Metaphor that highlights sand characteristics:

> After adding sand to the media, water flow hit warp speed.
    - It didn't actually go that fast, but it did help speed water flow.

Simile that highlights sand characteristics:

> Sand acts like tiny balloons in the soil media.
    - Two unlike things are compared.

5. Guided Practice Exercises

Plant growing media: Perlite

Perlite is a siliceous mineral of volcanic origin. The grades used in container media are first crushed and then heated until the vaporization of combined water expands it to a light, powdery substance. Lightness and uniformity make perlite very useful for increasing aeration and drainage. Perlite often floats during irrigation or plant watering.

Have the class work in small groups to create a metaphor and simile that highlight perlite characteristics. Here are some examples:

Metaphor that highlights perlite characteristics:

> Adding perlite to the media created more elbow room for plant roots.
    - There are not actual elbows down there, but it does create more space for roots to grow.

Simile that highlights perlite characteristics:

> Perlite is like thousands of fluffy snowballs.
    - Two unlike things are compared, using white and airy as the points of comparison.

6. Independent Practice Exercises

Plant growing media: Sphagnum moss

Sphagnum moss is the dehydrated remains of acid-bog plants from the genus Sphagnum (i.e., Spapillosum). It is light in weight and has the ability to absorb 10 to 20 times its weight in water. This is attributed to the large groups of water holding cells, which is characteristic of the genus. Sphagnum moss contains specific substances that help it inhibit damping-off of seedlings.

Assign individuals to create a metaphor and simile that highlight Sphagnum moss characteristics. Here are some examples:

Metaphor that highlights Sphagnum moss characteristics:

> Sphagnum moss is the Under Armor® of plant media.
    - No workout clothes are in the plant pot , but both are light and moisture-absorbing.

Simile that highlights Sphagnum moss characteristics:

- Sphagnum moss is as thirsty as a guy stranded in the desert for 10 days.
  - Two unlike things are compared, using extreme thirst as the point of comparison.

7. Notes

Assign metaphors and similes for each media you discuss and have students make flash cards with the media name on one side and the metaphor on the other side. Use them to help students remember media characteristics (and the difference between similes and metaphors).

South Dakota AFNR

Academic Integration Activities: Example #13

→ *Wildlife and fisheries students can analyze factors that influence the credibility of informational sources.*

1. Ag Standard

Wildlife and Fisheries WR 2.1

Discuss the importance of hunting/harvesting fish and wildlife species and related responsibility.

- > Identify different viewpoints of hunting/fishing by interviewing people.
- > Describe wildlife harvesting techniques and procedures.
- > Identify management practices to protect fish and wildlife from overexploitation.

2. Academic Standard

11.R.5.1

Students can analyze factors that influence the credibility of informational sources.

- > Identify authorship.
- > Identify sponsorship.

3. Background Information

We live in the age of abundant and easily accessible information. Access to information can be priceless; it also can be damaging if used without caution. Evaluating resources for credibility can be an invaluable tool at any point throughout one's life. Evaluating is a higher order thinking task and not necessarily an inherit skill. Evaluating the credibility of resources requires a system (even if informal) for establishing credibility and practice.

As citizens, society benefits when its members are well informed and cognizant of differing viewpoints surrounding controversial issues. There are many times in life, especially outside of the academic world, when we are faced with information representing the opinion or beliefs of an individual or group of individuals. Recognize that opinions are not a bad thing, as they help us understand other peoples' point of view. That said, it is critical that we are able to distinguish opinion, hypothesis, and hard facts.

4. Example in Context/Guided Practice Exercises

Share specific literature, watch a documentary-style video clip, or read information aloud to students from this web link:
http://www.humanesociety.org/issues/bear_hunting/Background information for teacher

Either individually, by writing, or in small group discussion, ask students to respond to the following questions:

- What is your initial reaction in hearing/seeing this information? (How does it make you feel?)
- Would this information possibly cause you to change any of your previously held opinions on the matter or change any particular behavior?
- Picture someone you know well, but who you would consider to be very unlike you in his or her views/opinions/way of thinking. Describe how this person might respond to the above questions.

Provide students with information of an opposing viewpoint(s) to the same issue:

- http://www.bearsinbc.com/pages/02grizzly/02integral.html
    - Great one to start with
- http://dnr.wi.gov/org/land/wildlife/hunt/bear/popndist.htm
- http://dnr.wi.gov/org/land/wildlife/PUBL/wlnotebook/bear.htm#mana

Either individually, by writing, or in small group discussion, ask students to respond to the following questions:

- What is your initial reaction to hearing/reading/seeing this information?
- In what ways does it differ from the first example shared?
- How would that same person you pictured in the last example respond to hearing this?

Guide students through a discussion regarding credibility of resources using the following prompts and techniques:

- List the opinions presented (brief paraphrase) on the white board as students share them aloud.
- Ask students to list reasons as to why hearing opinions from both sides of an issue is important.
- Ask students why it is critical to become informed citizens who can hear multiple viewpoints and distinguish fact from opinion.
    - What are some of the ways we can identify if something is providing fact or opinion?
    - Ensure the following points are covered:
        - Figure out who published the information.
        - Be on alert for hidden agendas.
        - Scan the periphery of a webpage or printed literature for clues.
            - How does the web address end?(.com, .org, .net, .edu, or .gov)
            - Are there obvious sponsors or groups that may have provided funding for the page?
        - Check whether credible sources cited.
        - Assess the credibility of other websites to which the page links.
- Guide students through the above strategies as the class helps you assess each of the items above.
- Assess student understanding of the concept of establishing credibility. If needed, guide them through another example as a class.

Provide students with additional examples of opinions surrounding the harvesting/hunting of wildlife. (Either have students at a computer, or provide groups with literature printed off websites of your choice.)

5. Independent Practice Exercises

There are three tasks in this exercise:

a. Identify an issue surrounding the different viewpoints regarding hunting/harvesting wildlife within your geographic region or state.
b. Identify a minimum of two websites with pages dedicated to the issue.
c. For each website, capture notes addressing its credibility.
    > Provide students with the list of strategies/questions used to assess in the guided example.

6. Notes

A number of quality resources and activities related to the academic standard can be found with a simple search using any online search engine. Before "recreating the wheel," take a moment to check some out. Some are better than others, but you will likely find a good nugget or two you can put to good use.

This activity could be taken one step further by asking students to create a small worksheet they could use to assess the credibility of information found online for any of their academic classes.

South Dakota AFNR

Academic Integration Activities: Example #14

→ *Fundamental Plant Science students complete soil tests, examine the data, and draw conclusions.*

1. Ag Standard

Fundamental Plant Science PS.2.2
Students examine data to evaluate and manage soil/media and nutrients.

> Test soil/media and plant tissue for nutrient levels.
> Interpret test of soil/media and/or plant tissue.

2. Academic Standard

9-12.S.1.1
Students are able to draw conclusions from a set of data.

3. Background Information

Five-Number Summary
Consists of the upper and lower extremes, the median, and the upper and lower quartile.

> Upper extreme = Greatest number that occurs in the set
> Lower extreme = Lowest number that occurs in the set
> Median = Middle term when data arranged least to greatest
> Upper quartile = Median of the upper half of data
> Lower quartile = Median of the lower half of data

Steps to Determining Quartiles

a. Arrange data in order from least to greatest.
b. Identify the median.
c. Identify the middle term of each half of the data on either side of the median. These values are the upper and lower quartiles.

Example
Consider the set {1, 3, 4, 5, 6, 7, 9}.

> The lower extreme is 1.
> The lower half is {1, 3, 4}, and the middle term of that half is 3. Therefore, the lower quartile is 3.
> The median is the middle term, 5.
> The upper half is {6, 7, 9}, and the middle term of that half is 7. Therefore, the upper quartile is 7.
> The upper extreme is 9.

Outliers
An outlier is a value in a data set that is far from the other values. Outliers can be caused by experimental errors, measurement errors, or by a long-tailed population. In the former cases, it can be desirable to identify outliers and remove them from data before performing a statistical analysis,

because they can throw off the results and inaccurately represent the sample population. The simplest way to identify outliers is with the quartile method.

Instructions for Finding Outliers

a. Sort the data in ascending order.
   - > Example data set: {4, 5, 2, 3, 15, 3, 3, 5}.
   - > Sorted, it is {2, 3, 3, 3, 4, 5, 5, 15}.

b. Find the median. This is the number at which half of the data points are larger and half are smaller. If there is an even number of data points, the middle two are averaged.
   - > In the example data set, the middle points are 3 and 4, so the median is (3 + 4)/2, or 3.5.

c. Find the upper quartile, Q2. This is the data point at which 25% of the data are larger. If the data set is even, average the two points around the quartile.
   - > In the example data set, this is (5 + 5)/2, or 5.

d. Find the lower quartile, Q1. This is the data point at which 25% of the data are smaller. If the data set is even, average the two points around the quartile.
   - > In the example data set, (3 + 3)/2, or 3.

e. Subtract the lower quartile from the higher quartile to get the interquartile range, IQ.
   - > In the example data set, Q2 - Q1 = 5 - 3, or 2.

f. Multiply the interquartile range by 1.5. Add this to the upper quartile and subtract it from the lower quartile. Any data point outside these values is a mild outlier.
   - > In the example set, 1.5 x 2 = 3. 3 - 3 = 0 and 5 + 3 = 8. So any value less than 0 or greater than 8 would be a mild outlier. This means that 15 qualifies as an outlier.

4. Example in Context

Students test the soil pH of their home gardens. Each student brings in a sample of the soil used in their home gardens and runs pH tests. The class data is statistically analyzed.

What is the five-number summary of the data set?
Is there an outlier in the data set?

Review how to determine the five-number summary and find an outlier.

Five-Number Summary

a. Arrange data in ascending order.
b. Record lower extreme. (lowest value)
c. Record higher extreme. (highest value)
d. Record median. (middle term)
e. Record lower quartile. (median of lower half of data)
f. Record upper quartile. (median of upper half of data)

Outlier

a. Arrange data in ascending order.
b. Find median.
c. Find upper quartile.
d. Find lower quartile.
e. Subtract the lower quartile from the higher quartile to get the interquartile range.
f. Multiply the interquartile range by 1.5. Add this to the upper quartile and subtract from the lower quartile. Any data outside of these values is an outlier.

The following is the pH data from the students' home gardens:
6.7, 6.8, 6.5, 6.9, 6.2, 7.2, 6.4, 6.2, 6.6

What is the five-number summary of the data set?

Arrange data in ascending order.
6.2, 6.2, 6.4, 6.5, 6.6, 6.7, 6.8, 6.9, 7.2

Record lower extreme = 6.2
Record higher extreme = 7.2
Record median = 6.6
Record lower quartile = 6.3
Record upper quartile = 6.85

Answer: Five-number summary = (6.2, 6.3, 6.6, 6.85, 7.2)

Is there an outlier in the data set?

Arrange data in ascending order.
6.2, 6.2, 6.4, 6.5, 6.6, 6.7, 6.8, 6.9, 7.2

Find median = 6.6
Find lower quartile = 6.3
Find upper quartile = 6.85
Subtract the lower quartile from the higher quartile. Interquartile range: 6.85 – 6.3 = 0.55
Multiply interquartile range by 1.5. 0.55 X 1.5 = 0.825
Add that to the upper quartile. 6.85 + 0.825 = 7.68
Subtract that from the lower quartile. 6.3 - 0.825 = 5.48

Answer: There are no values in this data set that are outside the range of 5.48 to 7.68. Therefore, no, there are not any outliers in this data set.

5. Guided Practice Exercise

Students test the various soil nitrate levels using testing strips.

The following is the amount of nitrate found in each soil test:
45 ppm, 30 ppm, 20 ppm, 25 ppm, 5 ppm, 35 ppm, 40 ppm, 45 ppm, 40 ppm, 20 ppm, 30 ppm

What is the five-number summary of the data set?

Arrange data in ascending order.
5, 20, 20, 25, 30, 30, 35, 40, 40, 45, 45

Record lower extreme = 5
Record higher extreme = 45
Record median = 30
Record lower quartile = 20
Record upper quartile = 40

Answer: Five-number summary = (5, 20, 30, 40, 45)

Is there an outlier in the data set?

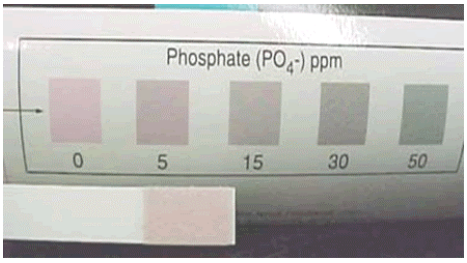
Arrange data in ascending order.
5, 20, 20, 25, 30, 30, 35, 40, 40, 45, 45

Find median = 30
Find lower quartile = 20
Find upper quartile = 40
Subtract the lower quartile from the higher quartile. Interquartile range = 20
Multiply interquartile range by 1.5. 20 X 1.5 = 30
Add that to the upper quartile. 40 + 30 = 70
Subtract that from the lower quartile. 20 - 20 = 0

Answer: There are no values in this data set that are outside the range of 0 to 70. Therefore, no, there are not any outliers in this data set.

6. Independent Practice Exercises

Students test the various soil phosphate levels using testing strips.



The following is the amount of nitrate found in each soil test:
5 ppm, 20 ppm, 15 ppm, 0 ppm, 25 ppm, 40 ppm, 20 ppm, 15 ppm, 5 ppm, 20 ppm, 30 ppm

What is the five-number summary of the data set?

Answer: Five-number summary = (0, 5, 20, 25, 40)

Arrange data in ascending order: 0, 5, 5, 15, 15, 20, 20, 20, 25, 30, 40

Record lower extreme = 0
Record higher extreme = 40
Record median = 20
Record lower quartile = 5
Record upper quartile = 25

Is there an outlier in the data set?

Answer: No, there are not any values outside of -25 to 55, so there are no outliers in this data set.

Arrange data in ascending order: 0, 5, 5, 15, 15, 20, 20, 20, 25, 30, 40
Find median = 20
Find lower quartile = 5
Find upper quartile = 25
Subtract the lower quartile from the higher quartile. Interquartile range = 20
Multiply interquartile range by 1.5. 20 X 1.5 = 30
Add that to the upper quartile. 25 + 30 = 55
Subtract that from the lower quartile. 5 - 30 = -25

Students test the soil pH of the soils around the school building prior to planting flowers. Here is the recorded pH data from various locations and a representative sample:
5.8, 5.1, 5.0, 8.0, 5.3, 5.5, 5.8

What is the five-number summary of the data set?

Answer: (5.0, 5.1, 5.5, 5.8, 8.0)

Is there an outlier in the data set?

Answer: Yes, 8.0 is an outlier because it is out of the acceptable range of 4.05 to 6.85.

7. Notes

[None]

South Dakota AFNR

Academic Integration Activities: Example #15

→ *Environmental science students use graphs to express functions.*

1. Ag Standard

Environmental Sciences ES1.3

Analyze population Dynamics.

> Test the carrying capacity of a sample ecosystem.

2. Academic Standard

9-12.A.4.1

Students are able to use graphs, tables, and equations to represent linear functions.

3. Background Information

Linear equations are a fundamental component of Algebra class.

This cheat sheet will help refresh your memory:

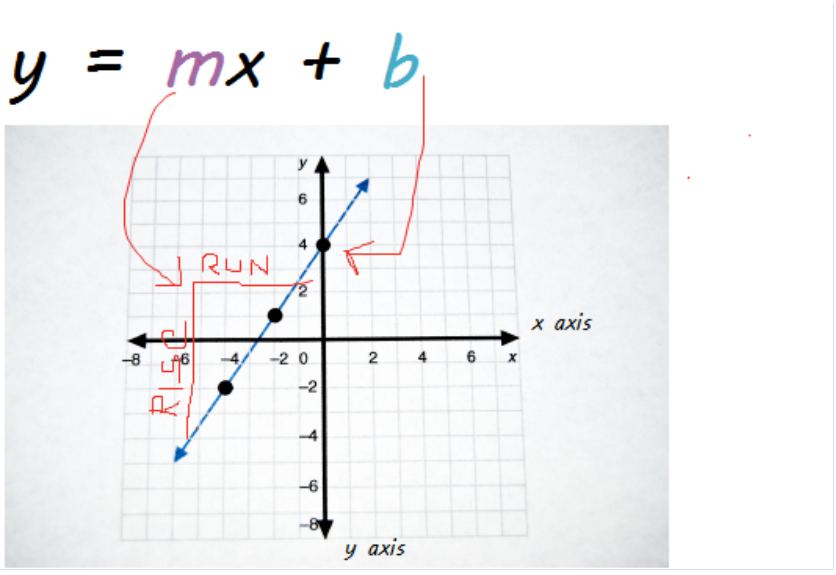
y = mx + b

y = The height/distance above or below the horizontal zero line at any given spot along the line.

m = The slope of the line, which tells us how steep the line is and is typically written in the fraction form rise/run.

x = The distance to the right or left of the vertical zero line.

b = The spot where the line crosses the y axis (vertical one).



For additional assistance, search "linear equations," and you will find pictures, notes, and videos to help you brush up.

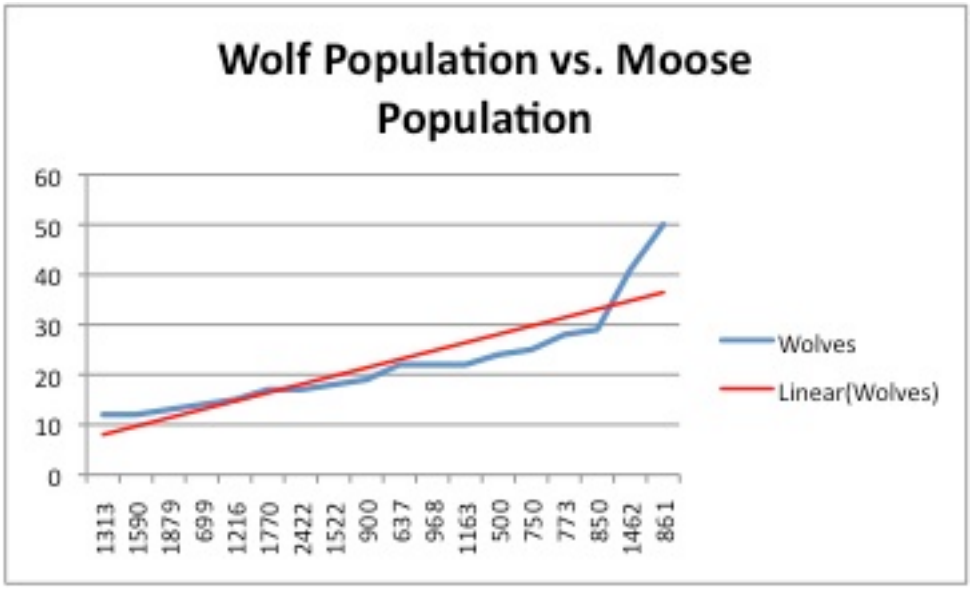
4. Example in Context

Define and discuss the concept of an ecosystem's carrying capacity.

- > Discuss limiting factors that can influence population growth.
- > Carrying capacity is not ultimately a number, but instead a relationship between population size and limiting factors affecting a species population growth.
- > A line graph is an excellent way to visually analyze how a limiting factor can affect an ecosystem's carrying capacity for a given species.

Share the example below to demonstrate an example of a carrying capacity graph.[1]

The graph below was produced from a table of data measuring how moose population influences the carrying capacity of wolves on Isle Royale (the largest island in Lake Superior). The limiting factor here is food. (Moose are a food source for wolves.)



- > Demonstrate how the points were plotted using the data table.

[1] Simplified from *Canyon Crest Media Center's* located at: http://teachers.sduhsd.k12.ca.us/cschildhouse/APBio08-09/3_Ecology/PopEcolGraphs.pdf.

Moose	Wolves
1313	12
1590	12
1879	13
699	14
1216	15
1770	17
2422	17
1522	18
900	19
637	22
968	22
1163	22
500	24
750	25
773	28
850	29
1462	41
861	50

- Label components of the graph
  - y-axis
  - x-axis
  - y-intercept
  - x-intercept
  - Slope (rise or run) or rate of growth
- Explain the concept of a best fit line or trend line when analyzing linear data.
  - Pose the question: What are scientists interested in knowing given this graph? (rate of population growth or decline, the relationship between the limiting factor and population growth, the point at which the population peaked, etc.)
- Ask and guide students through the following questions:
  - When the limiting factor is in abundance (or not so limiting), which direction does the line go?
  - What is represented along the y-axis? What about the x-axis?
  - Discuss the relationship between variables. Have students verbally fill in the blanks: "As _____ increases the population of _____ _____."
- Remind students of the algebraic formula for a line. Connect the concept of the linear equation and how it relates to the above items.
  - x-axis:
  - y-axis:
  - m or slope
  - b or y-intercept (may or may not be present, but define)
  - x-intercept
  - Review the term "slope" and how it is calculated by looking at rise/run. Demonstrate how you would calculate slope for this example.
  - Write out the formula for the best fit line in the example in the linear equation format and review.

5. Guided Practices

Have students work in groups to plot data to form a line graph and analyze the meaning of the data.

Provide students with the following data table and small group, in-class assignment:

- Create a line graph using the data below.
- Label each axis.
- Calculate the slope of the line.
- Write the linear formula representing this data set.
- Write a sentence or two explaining the relationship between acres of land and prairie chicken population.

acres	prarie chicken population
1000	13
2000	26
3000	39
4000	52
5000	65
6000	78
7000	91
8000	104
9000	117
10000	130

6. Independent Practices

Have students complete an example individually. Repeat the assignment as listed in the previous example independently using the following sample set of data:

Antelope	annual AUM available
10	24
14	33.6
18	43.2
27	64.8
33	79.2
38	91.2
47	112.8
52	124.8
55	132
61	146.4

7. Notes

If the concept of best fit line is difficult to grasp or appears too time consuming, the data in the first example could easily be simplified to create a perfect line.

Additional examples of actual population data can be found using a simple online search.